Powering Facility Neighbors with Landfill Gas

2011 Kansas Works!

Wichita, Kansas
March 22-24, 2011
U.S. Environmental Protection Agency
Landfill Methane Outreach Program (LMOP)

LANDFILL METHANE OUTREACH PROGRAM

Today's Agenda

- What is LMOP?
- Status of the LFGE Industry in the U.S.
- Benefits of LFGE/Project Incentives
- Status of LFGE projects in Kansas
- Case Studies
- LMOP Assistance

EPA's Landfill Methane Outreach Program

- Established in 1994
- Voluntary program that creates alliances among states, energy users/providers, the landfill gas industry, and communities

Mission: To reduce methane emissions by lowering barriers and promoting the development of cost-effective and environmentally beneficial landfill gas energy (LFGE) projects.

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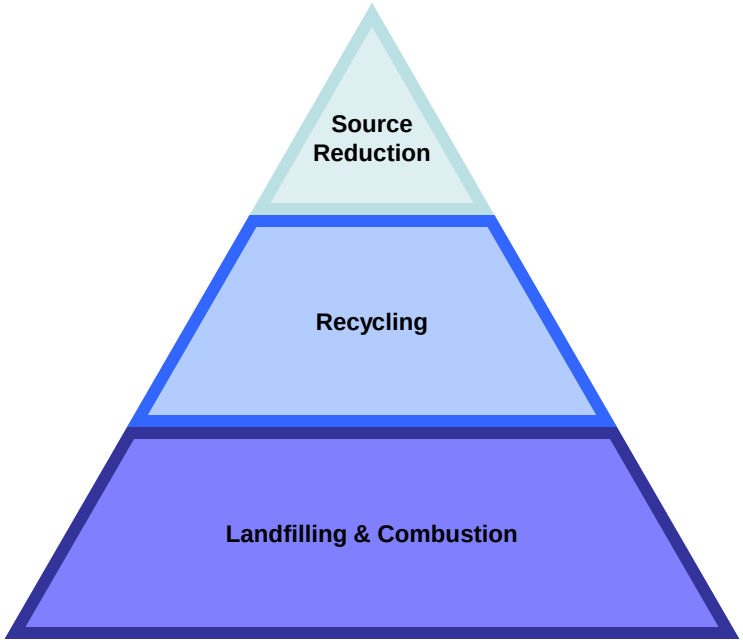
Waste Prevention



LMOP supports the EPA Solid Waste Hierarchy (Reduce, Reuse, Recycle, and Disposal)

Source reduction, also known as waste reduction, is the preferred solid waste tactic, followed by recycling. Waste that cannot be prevented or recycled can be incinerated or landfilled.

Why EPA is Concerned about Landfill Gas

- Why is methane a greenhouse gas?
  - Methane absorbs terrestrial infrared radiation (heat) that would otherwise escape to space (GHG characteristic)
- Methane as GHG is over 21 times more effective in trapping heat in the atmosphere than CO_2.
- Methane is more abundant in the atmosphere now than anytime in the past 400,000 years and 150% higher than in the year 1750.
- Landfills were the second largest human-made source of methane in the United States in 2008, accounting for 22.3% generated.

Landfill Gas and Green Power
A Winning Combination

- Dual benefit ➔ destroys methane and other organic compounds in LFG
- Offsets use of nonrenewable resources (coal, oil, gas) reducing emissions of
  - SO_2, NO_X, PM, CO_2
- LFG is a recognized renewable energy resource
  - Green-e, EPA Green Power Partnership, 28 states, Sierra Club, NRDC
- LFG is generated 24/7 and projects have online reliability over 90%
- LFG can act as a long-term price and volatility hedge against fossil fuels

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State of the National LFG Industry (December 2010)

- At least 541 operational projects in 46 states annually supplying:
  - **13 billion kilowatt-hours** of electricity and **100 billion cubic feet** of LFG to direct-use applications
- Estimated ‘10 **Annual** Environmental Benefits
  - Carbon sequestered annually by **~19,800,000 acres of pine or fir forests**, or
  - CO_2 emissions from **~216,000,000 barrels of oil consumed**, or
  - Annual greenhouse gas emissions from **~17,700,000 passenger vehicles**
- Estimated **Annual** Energy Benefits
  - Powering more than **940,000 homes** and heating more than **722,000 homes**

Diversity of Project Types Using LFG

- Electric Generation (~70% of all projects)
  - Reciprocating engines
  - Turbines
  - Microturbines
  - Combined heat & power (CHP)
- Direct-Use (~30% of all projects)
  - Boiler applications
  - Direct thermal (dryers, kilns)
  - Natural gas pipeline injection
    - Medium & high Btu
  - Greenhouses
  - Leachate evaporation
  - Vehicle fuel (LNG, CNG)

Pottery Studio Sugar Grove, NC

LFG-fired Boiler Ft. Wayne, IN

LFG Energy Projects and Candidate Landfills

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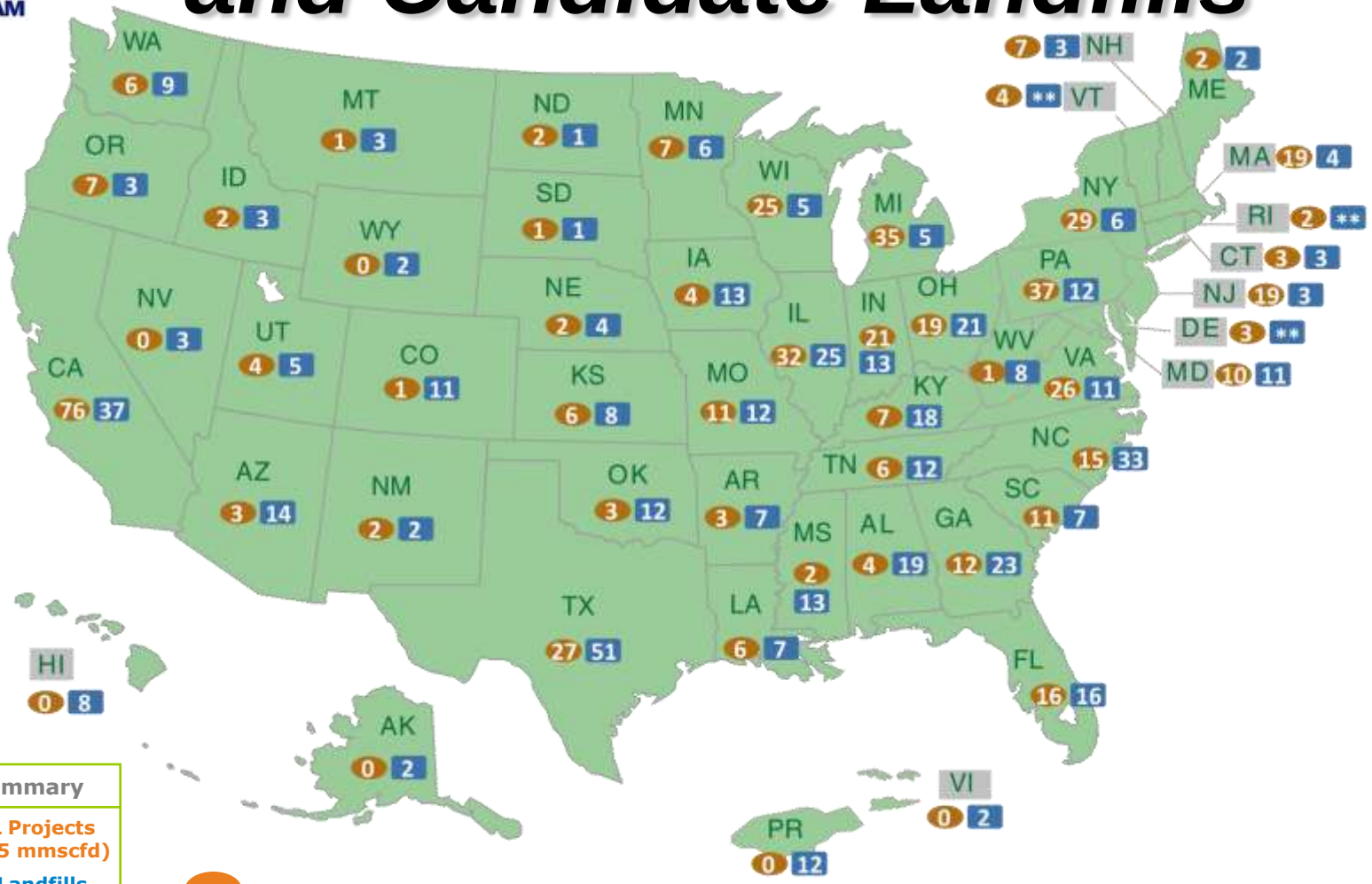

Nationwide Summary

541 OPERATIONAL Projects (1,684 MW and 305 mmscfd)

~510 CANDIDATE Landfills (1,160 MW or 580 mmscfd, 13 MMTCE Potential)

OPERATIONAL PROJECTS

CANDIDATE LANDFILLS*

* Landfill is accepting waste or has been closed for 5 years or less and has at least 1 mmtons of waste and does not have an operational/under construction LFGE project or is designated based on actual interest/planning.

** LMOP does not have any information on candidate landfills in this state.

These data are from LMOP's database as of December 15, 2010.

Local Economic Benefits

- LFG as a business development or retention strategy
- Job creation during construction and operation
- Local contractor use (concrete, grading, electrical, mechanical)
- Collateral benefits (lodging, food)

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LFG Has Been Used to Help Produce…

- Aluminum
- Alternative fuels (biodiesel, CNG, ethanol, and LNG)
- Aquaculture (e.g., tilapia)
- Arts & crafts (blacksmithing, ceramics, glass)
- Biosolids (drying)
- Bricks and concrete
- Carpet
- Cars and trucks
- Chemicals
- Chocolate
- Consumer goods and containers
- Denim
- Electronics
- Fiberglass, nylon, and paper
- Furthering space exploration
- Garden plants
- Green power
- Ice cream, milk, and tea
- Infrared heat
- Juice (apple, cranberry, orange)
- Pharmaceuticals
- Pierogies and snack food
- Soy-based products
- Steel
- Tomatoes (hydroponic)
- Taxpayer savings and increased sustainability!


Honeywell
NUCOR
HILL AIR FORCE BASE, Utah OGDEN AIR LOGISTICS CENTER
DART
CYTEC
Rolls-Royce
SENECA Foods.com "A World Leader In Agribusiness"
Owens Corning
Cargill
Ford
BMW The Ultimate Driving Machine
The Solae Company
Frito Lay
GM
INTERNATIONAL
Look Who's Using Landfill Gas!
LAFARGE
Jenkins Brick Company
AJINOMOTO
CONE corporatedenimfinishingjacquards
Nestlé Makes the Very Best
INTERNATIONAL PAPER From innovation to results.
INTERFACE
NASA
MALLINCKRODT
DUPONT The miracles of science
Lucent Technologies Bell Labs Innovations
SUNOCO
SC Johnson
CHRYSLER
TURKEY HILL

LFG and State Renewable Portfolio Standards

- LFG is eligible as a renewable resource for 36 states and District of Columbia
- Renewable Portfolio Standard (RPS) – requires utilities to supply a percentage of power from renewable resources
  - 29 states plus District of Columbia have an RPS
  - Kansas has an RPS of 20% of power from renewable energy by 2020.
- Renewable Portfolio Goal (RPG) – same as RPS except an objective not a requirement
  - 7 states have an RPG

State of LFGE in Kansas

- **6 Operational Projects**

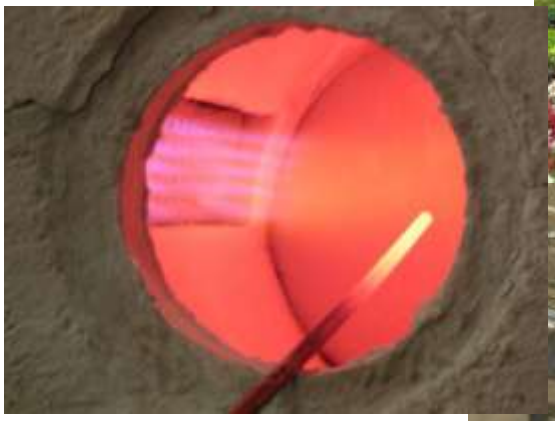
  Generating 17.85 million standard cubic feet of gas per day and 7.2 MW

  - 2 direct use projects
    - Brooks LF – Wichita
    - Seward County LF
  - 1 infrared heater project (Allen County)
  - 1 High Btu project (Deffenbaugh LF)
  - 2 electricity projects
    - Rolling Meadows (5.6MW)
    - Oak Grove Landfill (1.6MW)

Diversity of Project Types
Direct Use of LFG

- Direct-use projects are growing!
  - Boiler applications – replace natural gas, coal, fuel oil
  - Direct thermal (dryers, kilns)
  - Natural gas pipeline injection (medium- & high-Btu)
  - Ethanol production
  - Greenhouse
  - Infrared heaters
  - Leachate evaporation
  - Vehicle fuel (LNG, CNG)
  - Glassblowing & pottery
  - Blacksmithing
  - Hydroponics
  - Aquaculture (fish farming)

Greenhouse
Jackson County, NC



Glassblowing
Jackson County, NC

Infrared heater - Lorton, VA

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Greenfield Case Study
Victory Environmental Services Landfill & Boral Bricks
Terre Haute, IN

- Direct use of LFG for kilns at a brick facility (750 scfm)
- A major consideration for facility location was proximity to the landfill (Republic).
- Facility opened in 2008 and can produce up to 125 million bricks a year as a zero waste facility.
- LFG is transported via a 1.2-mile pipeline that includes a horizontal bore under a finger lake.
- Largest brick producing facility in the US and employs 50 people.

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Direct-Use Case Study

City of Sioux Falls Regional Landfill & POET Landfill Gas Energy Project (SD)

- 1,250 scfm of gas is transported via an 11-mile pipeline to POET's 105-million gallons/year ethanol plant
- LFG reduces the plant's natural gas usage by 2/3
- Landfill is currently expanding LFG wellfield to further offset the plant's natural gas use
- City takes advantage of the sale of carbon credits from the project, in addition to the sale of the landfill gas

LMOP 2010 Project of the Year

Multi-Use Case Study
Fred Weber Landfill
Maryland Heights, MO

- Start-up in 1997
- Project highlights:
  - Fred Weber, a construction company operates the landfill. The Pattonville High School ecology club initiated the project to use a portion of the LFG for the high school's boilers.
  - Fred Weber funded the 0.7-mile pipeline. The recovered LFG fuels to the boilers saves the school approximately $27,000 annually.
  - Additional LFG is used to heat a nearby greenhouse.
  - LFG also fuels infrared heaters at the landfill.
  - A portion of the LFG also fuels the asphalt plant at Fred Weber.
  - **Landfill and Ameren are currently working on a 16 MW project to go on-line in Spring 2012!**

Recent Award-Winning Industrial Projects

- Newton County, IN.
  - New green business park that will use LFG for energy
  - First user, Urban Forest Recyclers an egg carton manufacturer
- City of Toledo, OH.
  - LFG and WWTP methane combined to make electricity and heat
- Mars Foods, TX
  - LFG used to power boilers
- Conestoga LF, PA
  - Seven industrial end-users

Celebrating LMOP's Community Partner of 2008- Seward County, Kansas

Celebrating LMOP's State Partner of 2009- KDHE

How Can We Work Together? Direct Project Assistance

- Analyze landfill resource – gas modeling
- Identify potential matches – *LMOP Locator*
- Assess landfill and end user facilities
- Look at project possibilities
  - Direct-use (boiler, heating, cooling, direct thermal)
  - Combined Heat & Power (engine, turbine, microturbine)
  - Electric (engine, turbine, microturbine)
  - Alternative Fuels (medium or high Btu, LNG, CNG)
- Initial feasibility analyses – *LFGcost*

LMOP Tools and Services

- Network of 700+ Partners (and growing)
- Newsletter and listserv
- Direct project assistance
- Technical and outreach publications
- Project and candidate landfill database
- Web site (epa.gov/lmop)
- Support for ribbon cuttings and
- other public relations
- Presentations at conferences
- State training workshops
- 15th LMOP Annual Conference, Project Expo & Partner Awards will be in January 2012 in Baltimore, MD.

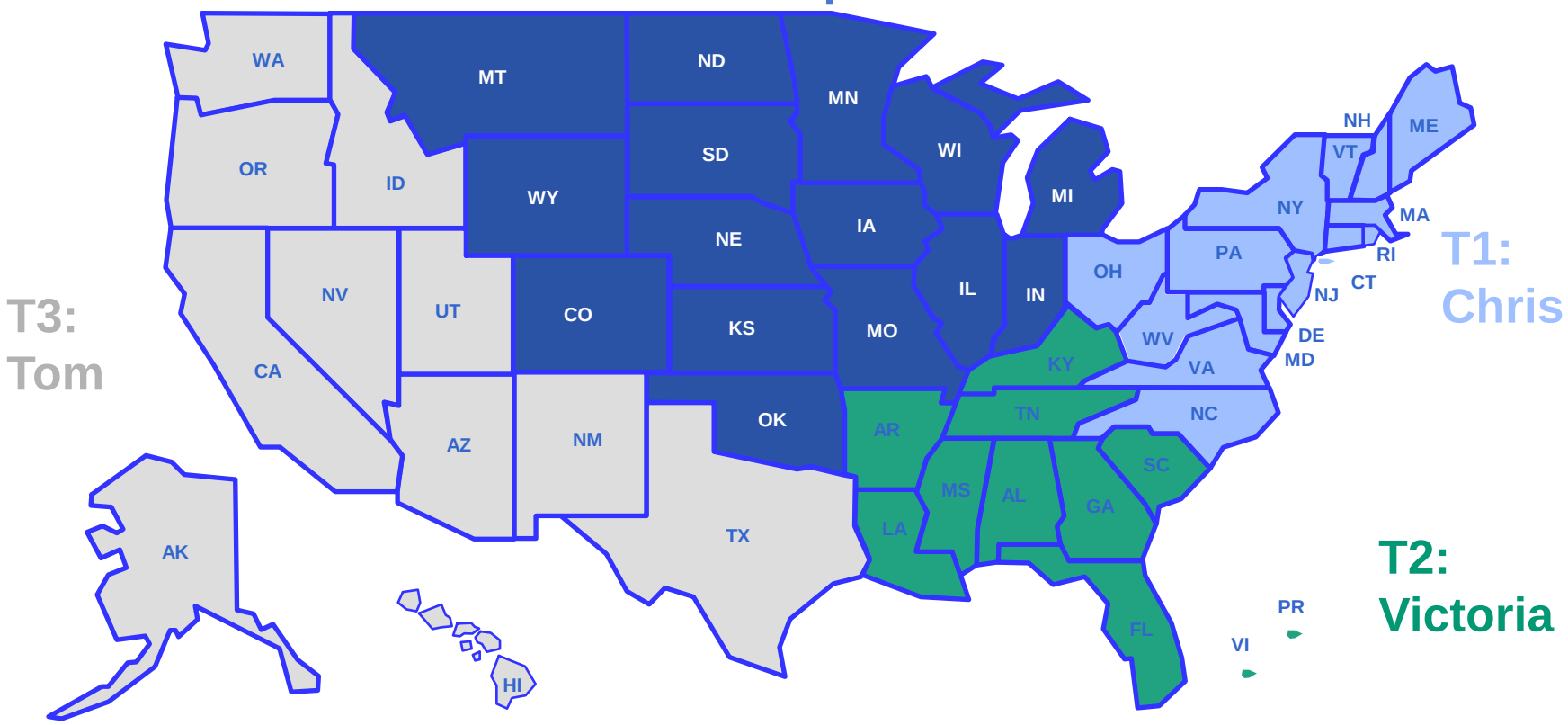
EPA Administrator
Stephen L. Johnson

Keynote Speaker
11th Annual LMOP Conference
Washington, DC

January 9, 2008

For More Information

www.epa.gov/lmop



Rachel Goldstein, Team Lead
goldstein.rachel@epa.gov, (202) 343-9391

Victoria Ludwig
ludwig.victoria@epa.gov, (202) 343-9291

Swarupa Ganguli
ganguli.swarupa@epa.gov, (202) 343-9732

Tom Frankiewicz
frankiewicz.thomas@epa.gov, (202) 343-9232

Chris Godlove
godlove.chris@epa.gov,
(202) 343-9795